The Lean Program Office

presentation to the

Defense Software Summit

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The Lean Program Office…..

The lean program office is sharply focused on customer value, and accomplishes its tasks with a cyclic rhythm that responds to the needs of its customers and stakeholders. Under lean program management, simultaneous teams accomplish their work in a highly synchronized manner, removing defects at the point of inception. The Chief Engineer owns the system architecture, and ensures that the activities of the highly skilled program staff are architecture-centric.

The lean program office team is fast, flexible, learns quickly, and responds to change quickly, using mature, controlled processes that are improved quickly. The improvement infrastructure is lean, CMMI-compliant, and uses six sigma mechanisms and process control approaches. The staff has eliminated waste in their processes (which are integrated with key contractor and stakeholder processes), and ensures support functions are accomplished in an efficient manner. They communicate with each other and with key stakeholders visually, employing Kanban decision making where appropriate.

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"What, are you crazy?!" (to Mr. Sakamoto -"Gung Ho"-1986)

Some outrageous claims follow….

- Lean Thinking has not been fully brought to bear on acquisition problems…
  - Lean is MUCH [more than] [waste elimination] and resource reduction
  - The full context [of Lean Thinking in creative] environments is applicable to t[...]
- The CMMI is a KE[Y] [enabler for the applicat]ion of Lean Thinking in creative environme[nts]
- Together, Lean Th[inking and the CMMI provide] a unique solution space to some of the mos[t challenging problems in a]cquisition

Lean Thinking, the [CMMI], [and Six] Sigma are perfectly interactive, mutua[lly-supportive disciplin]es, that, together, provide an improv[ement and operational] paradigm that is __at least an order of magnitude better__ than any of them alone.

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Lean/CMMI/Sixσ Venn Diagram

- Strategic focus
- Customer value
- Rapid improvement

- Improvement framework
- Mature best practices
- Robust appraisal methods

CMMI

Lean Thinking

6σ
Process
Control

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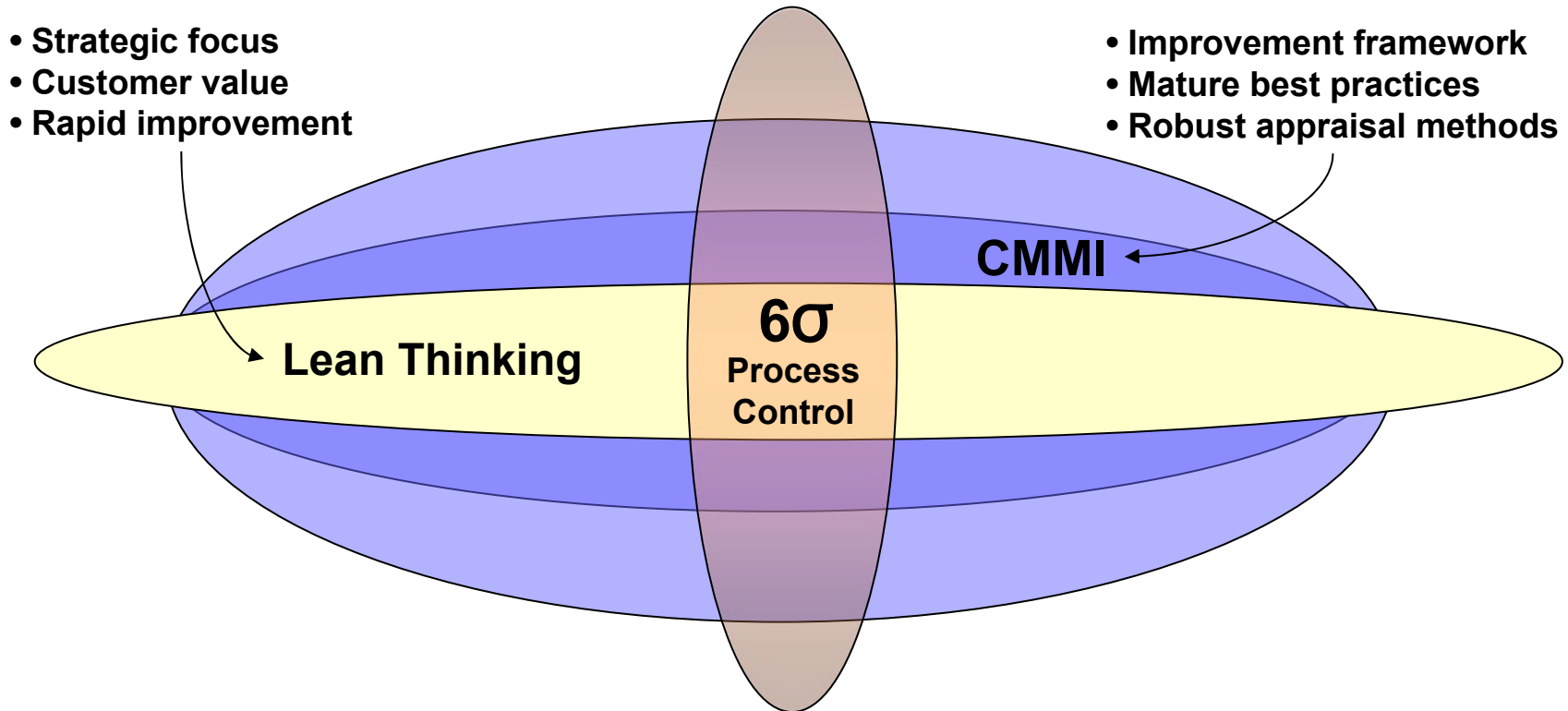
Experience in Lean Software Development

- Application of Lean Software Development in a CMMI-DEV compliant environment has led to:
  - Higher productivity
  - Reduced product defects
  - Much faster cycle times/product through-put
  - Integration of project performance with CMMI capability or maturity
  - Faster learning teams and organizations
  - Absolute solution to "buy-in" issues
  - (Much) faster improvement of processes and performance
- Field data is from:
  - Three organizations (two Government, one contractor)
  - More than 20 project life cycles
  - Small to medium project size

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2006 Defense Summit Issues and Recommendations

- **Keynote**:
  - Reshape the [acquisition] enterprise using short- and long-term initiatives that **accelerate lasting change for elements of the acquisition system**.
  - **Strive to reduce cycle time, improve communications**, and increase competitiveness.
  - **Reduce or eliminate adverse software trends, including poor requirements, immature architectures, incomplete planning, poor scheduling, and vague metrics**.
- **Root causes**:
  - **limited staff experience**
  - **poor planning**
  - **inadequate program documentation, and**
  - **incomplete risk management**
- **From Summit Recommendations:**
  - Establish a culture of quantitative planning and management, **using proven processes with collaborative decision making across the software life cycle.**
  - **Collaborate on innovative strategies to staff to appropriate levels** and to attract, develop, and retain qualified talent to meet current and future software engineering needs in government and industry.
- S**oftware Acquisition and Sustainment Barriers and Recommendations**
  - DoD lacks adequate numbers of trained and experienced government systems and software engineers.
  - **Establish <u>evolvable</u> systems and software architectures**
  - **Establish an infrastructure that provides "no-cost" support, such as providing advice, conducting program reviews, and sharing lessons learned, to the project management office**
- **Software Engineering Issues:**
  - Software life cycle planning and management are ineffective**; acquirers and suppliers need better software life cycle planning and management methods.**
  - **Acquisition methods have insufficient infrastructure (e.g., guidelines, procedures, and incentives) to create and facilitate reuse across organizations.**

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Who am I?

- Affiliations:
  - Chief Engineer, Jacobs Technology ITSS
  - Visiting Scientist, Software Engineering Institute
- NDIA:
  - Member of the Steering Committee, NDIA Systems Engineering Division
  - Industry Co-Chair of the NDIA Software Committee, and Member of the Software Industry Expert Panel
  - Co-Chair of the CMMI Technology Conference and User Group
- Credentials:
  - SCAMPI Lead Appraiser
  - (Lean) Six Sigma Black Belt
- Experience:
  - 31 years in systems and software development, test, performance improvement, and engineering management
- Education:
  - B.S. Aerospace Engineering
  - M.S. Operations Research

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Outline

- Background:
  - What is Lean for creative environments about?
  - Why is the CMMI a valuable "lean enabler"?
- What is the Lean Program Office?
  - What it looks like
  - How it might operate
- How can we get there from here?

Based on work accomplished by Jacobs Technology and research performed in cooperation with the Software Engineering Institute

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Lean Thinking for Creative Environments

- Sharp, continuously refreshed focus on customer value
- Iterations and synchronization ("acquisition cadence")
- "Agile" program management
- Highly skilled individuals
- Highly developed teams
- Rapid improvement
- Rapid learning
- Kanban visualization and decision making
- Architecture-centricity
- Waste elimination

A SURPRISING THING HAPPENED...

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The CMMI is a Lean Enabler

- Mature set of domain-specific practices
  - System, software, and hardware development
  - Acquisition
  - Lean interpretation is now an accepted practice
    - Required elements (goals)
    - Expected elements (practices)
- Proven infrastructure for process management
  - Responds to observed lack of lean process mgt.
  - Multiple VSMs may lose data and process workflow/process interfaces
- Accommodating appraisal method
  - SCAMPI is a well respected method with three value/ROI propositions
  - SCAMPI supports assessment of lean objectives and lean alternative practices

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Lean Application of the CMMI-ACQ

- 16 core process areas
- 6 Acquisition-Specific process areas
- Goals are all REQUIRED elements of the model
- Practices are all EXPECTED elements…
  - Alternatives (for practices that may not support lean operations) may be substituted (even many-for-one if appropriate)
  - The Goal must always be supported
- Extensive experience base in "leaning" CMMI practices
- In the end, CMMI-ACQ will be a high-value Lean <u>enabler</u> for the Lean Program Office

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CMMI-ACQ Process Areas

List of Core Process Areas

The following processes are considered core in the CMM Foundation:
- Causal Analysis and Resolution (CAR)
- Configuration Management (CM)
- Decision Analysis and Resolution (DAR)
- Integrated Project Management (IPM)
- Measurement and Analysis (MA)
- Organizational Innovation and Deployment (OID)
- Organizational Process Definition (OPD)
- Organizational Process Focus (OPF)
- Organizational Process Performance (OPP)
- Organizational Training (OT)
- Project Monitoring and Control (PMC)
- Project Planning (PP)
- Process and Product Quality Assurance (PPQA)
- Quantitative Project Management (QPM)
- Requirements Management (REQM)
- Risk Management (RSKM)

Agreement Management
Acquisition Requirements Development
Acquisition Technical Management
Acquisition Validation
Acquisition Verification
Causal Analysis and Resolution
Configuration Management
Decision Analysis and Resolution
Integrated Project Management
Measurement and Analysis
Organizational Innovation and Deployment
Organizational Process Definition
Organizational Process Focus
Organizational Process Performance
Organizational Training
Project Monitoring and Control
Project Planning
Process and Product Quality Assurance
Quantitative Project Management
Requirements Management
Risk Management
Solicitation and Supplier Agreement Development

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Lean Application of CMMI Practices
(Examples)

- Technical Reviews

Examples of technical reviews that can be conducted include the following:

- Initial Technical Review (ITR)
- Alternative System Review (ASR)
- Integrated Baseline Review (IBR)
- Technology Readiness Assessment (TRA)
- System Requirements Review (SRR)
- System Functional Review (SFR)
- Preliminary Design Review (PDR)
- Critical Design Review (CDR)
- Test Readiness Review (TRR)
- System Verification Review (SVR)
- Production Readiness Review (PRR)
- Operational Test Readiness Review (OTRR)
- Physical Configuration Audit (PCA)

Lean would suggest:
- **Creative iterations**
- **Continuous test and defect removal**
- **Visual metrics**
- **Kanban decisions**
- **Possibly synchronous teams**

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Lean Application of CMMI Practices
(Examples)

- Risk Management

SG 1 Prepare for Risk Management

    SP 1.1   Determine Risk Sources and Categories

    SP 1.2   Define Risk Parame...

    SP 1.3   Establish a Risk Ma...

SG 2 Identify and Analyze Risks

    SP 2.1   Identify Risks

    SP 2.2   Evaluate, Categoriz...

SG 3 Mitigate Risks

    SP 3.1   Develop Risk Mitigation Plans

    SP 3.2   Implement Risk Mitigation Plans

Lean would suggest:
- **Rapid mitigation**
- **Mgt. focus on mitigation velocity**
- **Integrated risk management**
- **Predictable Risk Mgt. work cycles**

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Lean Application of CMMI Practices
(Examples)

- Process and Product Quality Assurance

SG 1 Objectively Evaluate Processes and Work Products

    SP 1.1   Objectively Evaluate Processes

    SP 1.2   Objectively Evaluate Work Products and Services

SG 2 Provide Objective Insight

    SP 2.1   Communicate and Ensure the Resolution of Noncompliance Issues

    SP 2.2   Establish Records

Lean would suggest:
- **Synchronous audit cycles**
- **Kanban notifications and "pull" audits**
- **Prepared teams, rapid audits**
- **Defects identified and eliminated in days, not weeks or months**

What is the Lean Program Office?

Fast learning and early maturity

Led by an Agile Program Manager

Architecture-Centric Operations

Process Integration and Synchronization

Kanban visual Decisions

Lean/CMMI Maturity

Program Management Office

- Mature Lean PMO processes tightly
- Visual metrics or indicators "pushed" to right person at right time
- NO mgt. "direction"
- Activities are "pulled" by PMO team

VISUAL architectures are needed
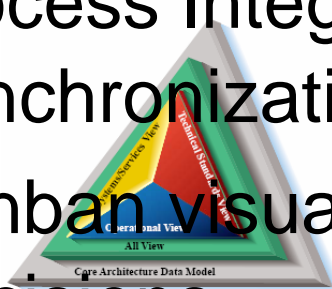
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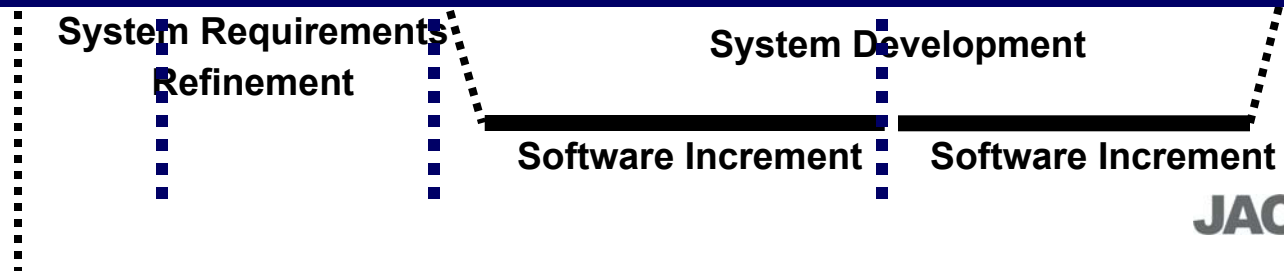
What are Acquisition Iterations?

- Source Selection
  - RFP generation and evolution
  - Proposal evaluation
- Program Execution
  - Architecture evolution (creative iterations)
  - Oversight of contractor team (operational cycles)
    - Contractor process capability
    - Requirements mgt.
    - Risk mgt. (lean risk mgt.)
    - Budget oversight
  - Oversight of technical deliverables
    - Depends on developer life cycle (single step, incremental, spiral SW)
    - Preparation for technical evaluation
    - Technical evaluation
    - Feedback to developer in a timely manner
  - PMO Team development
  - Communications with stakeholders

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Acquisition cadence and synchronization allows the elimination of the following types of waste:

- Wait time and work product decay
- Motion
- Unused work products
- Task switching

System Requirements Refinement

System Development

Software Increment

Software Increment

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Lean Teams

Highly skilled team members

Communicate openly

Fast learners

Agile Program Manager

Chief Architect

Agile Engr. Support (CM/QA/Test)

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Lean Organizations

Provide rapid/lean improvement infrastructure

Stimulate organizational learning

Understand process and technology discipline

Focus on customer-driven performance objectives

Allow lean functions and team to own their processes

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How do we get There from Here?

- Perform Value Stream Mapping session for core PMO as early as possible
    - Define PMO performance measures
    - Identify near term "future state"
- Add (lean) CMMI-ACQ as early as possible
- Mentor lean/CMMI team members to develop tacit knowledge as quickly as possible
- Adopt lean/CMMI processes based on workflows
- Work toward a "Lean CMMI" PMO capability:
    - Team Level 2 by RFP release?
    - Team Level 3 by contract start?

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